

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of

Wireless E911 Location Accuracy
Requirements

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PS Docket No. 07-114

REPLY COMMENTS OF VERIZON AND VERIZON WIRELESS

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SUMMARY

The record does not support expanding the current E911 Phase II regulatory framework to apply it to indoor calls, at the more stringent horizontal accuracy levels and the new vertical accuracy component proposed in the *FNPRM*. While improvements in location estimates may be feasible in the future, experience shows that any such improvements will continue to diminish over time. Commenters broadly agree that, instead, the ability to transmit a dispatchable address for many indoor 911 calls would have significant public safety benefits over the *FNPRM*'s proposed standards and timelines. Standards and technology development will be necessary to make dispatchable address information widely available, but important progress has already been made and it would better serve the Commission's public safety objectives. And requiring incremental improvements in location estimates risks repeating the wireless E911 experience, when the Commission adopted regulations geared toward a network-based technology even as the more accurate Assisted-GPS ("A-GPS") alternative was around the corner.

The proposed accuracy standards are not technically feasible. Supporters of the *FNPRM*'s proposed standards downplay (or do not acknowledge) the limitations of the CSRIC Test Bed results or omit critical steps necessary to make indoor location solutions viable. Vendors supportive of new rules do not offer solutions that would achieve the proposed standards in all markets and all environments. Nor do they present credible timetables for the commercial availability of their products, either alone or in combination with others.

For example, TruePosition is dependent on the use of A-GPS as a supplement to its existing network-based solution, which already has been rejected in the marketplace. It is also dependent on an increase in handset power during 911 calls that has not been tested for its impact on wireless networks. NextNav would exclude sizeable geographic areas of the United States entirely outside the coverage of its metropolitan beacon system solution because of the limited scope of its licensed spectrum. And even where it has spectrum NextNav has indicated that it is focused on deployment in significant metropolitan areas. NextNav also understates the impact of its technology for wireless handsets and networks, and the importance of technology standardization for commercial availability.

Several commenters, however, offer the components of an alternate policy framework that would achieve the Communications Act's public safety objectives more effectively and efficiently than the *FNPRM* approach. Specifically, any timetables for implementing new technically feasible indoor accuracy standards should be (1) triggered by independent test bed verification that compliant, commercially available solutions are available, and (2) phased in to account for network and handset deployment challenges and PSAP readiness.

Commenters uniformly support an independent test bed-based approach to measure whether a particular location solution will meet any new accuracy standards that are adopted. Deployment timetables based on test bed results, rather than the speculative assertions of vendors, will facilitate collaboration among stakeholders in a manner that better accounts for technology and marketplace realities by: accounting for standardization and technology development efforts that are not within service providers' control; ensuring that any standards and timetables do not outpace technology; fostering a cooperative, less adversarial environment

among service providers, manufacturers, solution providers and public safety; and simplifying and mitigating ongoing monitoring and oversight burdens.

Public safety and industry stakeholders (including solution vendors) all acknowledge that new technologies cannot be implemented on a flash-cut basis nationwide within the timetables proposed in the *FNPRM*. Any new horizontal and vertical indoor standards should be phased in using POPs-based or other technically feasible implementation benchmarks that also account for the availability of capable handsets to consumers. Public safety and industry commenters also broadly agree that PSAPs will require additional capabilities to be able to receive and utilize vertical location information. Thus, PSAP readiness should remain a part of any new implementation timetables.

Finally, the rulemaking record acknowledges the trade-off between accuracy and delivery timing (latency), particularly in challenging indoor environments. No parties explain how a significantly shorter latency standard than the 30-second period proposed in the *FNPRM* is technically feasible and, indeed, others explain how the proposed standard is internally inconsistent. Nor is location-based routing a sound basis for imposing a substantially more stringent delivery timing standard. Delivery timing should instead be measured in a test bed independent of the location accuracy standard, consistent with the CSRIC Test Bed. At minimum, given the challenges that service providers and vendors already will face in improving indoor accuracy, the 30-second period should not apply to *indoor* 911 calls.

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Verizon and other commenters have provided recommendations for improving indoor location accuracy that, if adopted, would (1) enable wireless service providers to deploy technically feasible wireless location solutions focused on geographic areas and PSAPs with the most significant and immediate benefit to public safety, (2) improve the delivery of enhanced 911 (“E911”) location data and how it is presented to 911 call takers through new standards and best practices, and (3) facilitate future cooperation and collaboration between service providers and public safety stakeholders through targeted disclosure of performance data and informal resolution of localized concerns that may arise. The record in this proceeding thus offers an indoor location accuracy policy framework that would account for the technical challenges facing wireless service providers, solution and technology vendors, and PSAPs alike, and would balance those challenges with consumers’ and public safety’s interest in location accuracy improvements, more effectively than the proposed rules in the *FNPRM*.²

¹ In addition to Verizon Wireless, the Verizon companies participating in this filing are the regulated, wholly owned subsidiaries of Verizon Communications Inc. (collectively, “Verizon”).

² *Wireless E911 Location Accuracy Requirements*, Third Further Notice of Proposed Rulemaking, 29 FCC Rcd 2374 (2014) (“*FNPRM*”).

DISCUSSION

I. THE RULEMAKING RECORD DOES NOT SUPPORT APPLYING INFEASIBLE STANDARDS TO INDOOR LOCATION ACCURACY.

The record in this proceeding does not support expanding on the current E911 Phase II regulatory framework to apply it to indoor calls at the more stringent horizontal accuracy levels and the new vertical accuracy component proposed in the *FNPRM*. The record demonstrates that the near-term indoor location solutions that are the basis for the proposed standards and deadlines in the *FNPRM* face limits due to architectural design or the laws of physics (or both) that vary in degree depending on the technology and the particular RF environment in which a 911 call is dialed.³ The potential improvements in the accuracy of the x, y and eventually z coordinates proposed in the *FNPRM* and promised by several vendors are, by definition, estimates of 911 caller location. Irrespective of the horizontal or vertical accuracy standards that may be technically feasible at some point, experience shows that any such improvements will continue to diminish over time.⁴

In contrast, there is widespread agreement among public safety, industry and consumer commenters that the ability to transmit a dispatchable address for many indoor 911 calls would have significant public safety benefits as compared to the *FNPRM*'s proposed standards and

³ See Verizon Comments at 9, 12-21, Attachment; AT&T Comments at 5-7; Cisco Comments at 3; Intrado Comments at 5-7; NextNav Comments at 6; Polaris Wireless Comments at 3-4; TeleCommunication Systems (TCS) Comments at 4-6; T-Mobile Comments at 1-2; TruePosition Comments at 8, 11; see also APCO Comments at 2 (indoor wireless 911 calls do not have same address-specific information as wireline); NENA Comments at 19 (“[n]on-translated latitude/longitude/uncertainty figures are ... of limited utility by themselves” in comparison to dispatchable addresses).

⁴ See Verizon Comments at 10-11; AT&T Comments at 1-2, 10-12; TCS Comments at 3; T-Mobile Comments at 5; see also Blooston Rural Carriers Comments at 2-3 (concern for potentially stranded costs).

timelines.⁵ As Verizon and other commenters explained, standards and technology development will be necessary to make dispatchable address information broadly available to consumers and enterprises.⁶ The record nevertheless presents an alternative technology and policy path that would better serve the Commission’s public safety objectives while more effectively and efficiently leveraging commercial location technologies.

By that same token, NextNav’s dismissive characterization of alternate technologies like dispatchable address as “green field proposal[s]”⁷ rings hollow given the solutions described in the record that are under development⁸ as well as the nascent status of its own technology. NextNav’s proposed policy of “incremental improvements to the indoor location capabilities that are now available or under development”⁹ risks distracting from the goal of dispatchable address technologies and would set in motion the very dynamic Verizon warned against in its comments: “continued significant investments on a particular location accuracy solution [that] will achieve diminishing incremental improvements.”¹⁰ And TruePosition would similarly have the

⁵ See Verizon Comments at 11; APCO Comments at 4; AT&T Comments at 2-3, 10-12; Cisco Comments at 6-12; Int’l Ass’n of Fire Chiefs (IAFC) Comments at 1; Int’l Ass’n of Fire Fighters (IAFF) Comments at 6-7; Intrado Comments at 2-5; NENA Comments at 18-20; Polaris Wireless Comments at 4-5; Qualcomm Comments at 8-9; Sprint Comments at 13-14; T-Mobile Comments at 5-6; Telecommunications for the Deaf Comments at 4-5; *see also* Boulder Reg’l Emergency Tel. Serv. Auth. (BRETSA) Comments at 25-27.

⁶ See Verizon Comments at 10-11; AT&T Comments at 3; Qualcomm Comments at 8-9; TCS Comments at 6-7; *see also* Cisco Comments at 4 (“there are issues to be solved with Cisco’s proposed approach including ... certain technological developments”).

⁷ NextNav Comments at 34.

⁸ See AT&T Comments at 4 n.6; Cisco Comments at 9; Ericsson Comments at 4; Intrado Comments at 8-12; Qualcomm Comments at 8; TCS Comments at 15-22; *see also* BRETSA Comments at 10, 28 (describing Intrado technology); Texas 911 Entities Comments at 7-8 (same).

⁹ NextNav Comments at 34.

¹⁰ See Verizon Comments at 10; *see also* T-Mobile Comments at 5.

Commission view its Uplink Time Difference of Arrival (“U-TDOA”) as a desirable increment in indoor location accuracy improvement,¹¹ notwithstanding the limitations of that technology as various commenters have already described.¹²

The *FNPRM* and these vendors’ approach risks repeating the wireless E911 experience with handset-based Phase II solutions, when the Commission adopted regulations geared toward a network-based technology even as the more accurate A-GPS alternative was around the corner.¹³ By proposing standards and timetables that, as explained below, are not technically feasible, the *FNPRM* presents the risk of widespread waivers and associated litigation that occurred in earlier E911 rulemaking efforts.¹⁴ Given these risks, the *FNPRM*’s proposal to build on the current regulatory regime and its underlying technical presumptions by applying even more stringent standards to indoor environments should not be adopted.

II. THE RECORD DEMONSTRATES THAT THE PROPOSED LOCATION ACCURACY STANDARDS ARE TECHNICALLY INFEASIBLE.

At minimum, the record confirms that significant changes to the *FNPRM*’s proposed standards would be needed to ensure that they are technically feasible. Several commenters

¹¹ See Technocom, *TruePosition Indoor Test Report*, PS Docket No. 07-114, at 8 (June 18, 2014) (“*TruePosition Indoor Test Report*”); TruePosition, Press Release (June 24, 2014), http://www.trueposition.com/about-trueposition/news/press-releases/independent-testing-proves-existing-technology-can-meet-proposed-fcc-standards-for-indoor-9-1-1-location-accuracy/?lang=en_US (last visited July 14, 2014).

¹² See *infra* at 6-8.

¹³ See *Revision of the Commission’s Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Memorandum Opinion and Order, 12 FCC Rcd 22,665, ¶¶ 123-29 (1997); Public Notice, *Wireless Telecommunications Bureau Outlines Guidelines for Wireless E911 Rule Waivers for Handset-Based Approaches to Phase II Automatic Location Identification Requirements*, 13 FCC Rcd 24609 (WTB 1998); *Revision of the Commission’s Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Third Report and Order, 14 FCC Rcd 17,388, ¶¶ 6-7 (1999).

¹⁴ See Verizon Comments at 6.

supportive of the *FNPRM*'s proposed standards downplay (or do not acknowledge) the limitations of the CSRIC Test Bed results,¹⁵ or omit critical steps necessary to make indoor location solutions commercially available to service providers and scalable for wide area networks.¹⁶ Many commenters, including AT&T, Qualcomm, Sprint, and TCS, several of whom (like Verizon) participated in the CSRIC Test Bed and all of whom have extensive experience in delivering and developing E911 and commercial location-based services, affirm Verizon's assessment of the limitations of the Test Bed results and current location technologies.¹⁷ Moreover, inferring from the Test Bed results that the *FNPRM*'s proposed standards are feasible or reasonable, as proponents of the proposed standards argue, would undermine the critical fact-gathering role the Test Bed has played in this proceeding and jeopardize the future value of multi-stakeholder collaborative efforts like the CSRIC.

Vendors supportive of new regulations, by their own admission, do not purport to offer solutions that would achieve the proposed standards in all markets and all environments. Polaris Wireless would combine its network-based technology with A-GPS and the LTE-based O-TDOA technology Verizon Wireless already plans to use, as well as yet to-be-developed Wi-Fi

¹⁵ See CALNENA Comments at 1-2; Nat'l Ass'n of State 911 Adm'rs (NASNA) Comments at 6-7; Nat'l Ass'n of Regulatory Util. Comm'rs (NARUC) Comments at 8-9; Nat'l Ass'n of State Emergency Medical Services (EMS) Officials et al. (NASEMO) Comments at 2-3; NextNav Comments at 7-9; San Francisco Dept. of Emergency Mgmt. Comments at 2; *see also* Nat'l Pub. Safety Telecomms. Council (NPSTC) Comments at 4.

¹⁶ See NextNav Comments at 4-7; RX Networks Comments at 7-8; iPosi Comments at 24; NENA Comments at 14-16.

¹⁷ See Verizon Comments at 12-20; AT&T Comments at 7-10; Ericsson Comments at 2-3; Motorola Mobility Comments at 3-4; Qualcomm Comments at 7-15; Sprint Comments at 4-5; TCS Comments at 23-25; *see also* Cisco Comments at 2-3; Telecomms. Indus. Ass'n (TIA) Comments at 4-5.

and small cell capabilities.¹⁸ Polaris thus envisions that its technology would be a single component of a comprehensive solution involving multiple technologies and, necessarily, multiple vendors – it does not represent that wireless providers can meet the *FNPRM*’s proposed standards via its own technology alone, nor does it offer any potential timetable for making such a new hybrid technology commercially available to service providers or even for test bed evaluation. iPosi’s GPS/GLONASS technology is likewise dependent on widespread deployment of and integration with other vendors’ solutions, such as O-TDOA and small cells – but it does not offer a potential timetable for a commercially available hybrid technology either.¹⁹

TruePosition similarly would combine U-TDOA with A-GPS – which, as part of its own internal evaluation, was not tested in rural or dense urban environments.²⁰ Moreover, the purported advantages of TruePosition’s solution – leveraging higher cell site density and the wireless service provider’s radio access network signal propagation²¹ – are no different than the O-TDOA technology that Verizon is already deploying in its LTE network. TruePosition, moreover, requires the added burden of installing its Location Measurement Unit (LMU) receivers on the service provider’s base stations. Those base stations have already been deployed but in many cases, especially in urban areas, were not designed with the space necessary or do not support the environmental conditions for that added equipment. In addition, service providers with years of first-hand experience using A-GPS and TruePosition’s U-TDOA solution, such as AT&T and T-Mobile, have previously described the shortcomings of U-TDOA

¹⁸ See Polaris Wireless Comments at 3-6.

¹⁹ See iPosi Comments at 1-2, 8-23.

²⁰ TruePosition Comments at 6-12.

²¹ See *id.* at 7.

even with respect to the *less stringent* outdoor accuracy standard for network-based location solutions.²² Finally, it does not appear that TruePosition’s proposed hybrid solution would improve the accuracy of U-TDOA *per se*, but simply supplement the U-TDOA location fixes with enough A-GPS location fixes to improve the aggregate number of calls within a 50-meter standard.²³

In addition, while one of TruePosition’s prior selling points was its pure “overlay” architecture, it now would have the Commission further require that wireless handsets use 10-20dB higher power during 911 calls – a 10- to 100-fold increase in a handset’s transmitting power – to improve the performance of its LMUs and achieve higher accuracy levels.²⁴ Service providers could not readily implement this concept absent standards and testing efforts to ensure that the noise floor and overall RF interference environment are not adversely affected.

TruePosition is dismissive of those concerns,²⁵ but this feature could not conceivably be restricted to indoor calls, and the nature of emergencies is such that multiple wireless 911 calls can be triggered in a confined geographic area covered by the same cell sector. Handset manufacturers design wireless handsets’ RF management features to accommodate the

²² T-Mobile Comments at 17-18; Letter from Jamie M. Tan, AT&T, to Marlene Dortch, FCC, PS Docket No. 07-114, Attachment B at 1-2 (Sept. 9, 2013); T-Mobile Ex Parte Letter, PS Docket No. 07-114, at 2 (Nov. 16, 2013) (“T-Mobile estimates that U-TDOA is capable of performing within the 100 meter/300 meter requirement in fewer than half the counties in which T-Mobile provides service); *see also* T-Mobile County Exclusion Report, PS Docket No. 07-114, Exhibit (Dec. 18, 2013) (disclosing whole or partial county areas exempt from E911 rules for network-based solutions due to low cell site density).

²³ *See TruePosition Indoor Test Report* at 8 (its “Hybrid solution [is] based on a selection of the better of the two solutions (UTDOA and GPS ...), based on their respective uncertainties” and “the UTDOA location is utilized as the response for the initial location bid (e.g., for PSAP call routing) followed by the Hybrid location which would be provided when a PSAP requests a rebid”).

²⁴ *See TruePosition Comments* at 9-10.

²⁵ *See id.* at 10.

characteristics of a service provider's radio access network, and TruePosition's suggested change would necessarily raise the noise floor for all devices in the serving and surrounding cells.²⁶ And like Polaris Wireless, TruePosition offers no specific timetable for when the various components of its solution could be commercially available to service providers or even for test bed evaluation.

NextNav's technology is dependent on its own licensed spectrum and buildout plans and thus would still leave sizeable geographic areas of the United States entirely outside the coverage of its metropolitan beacon system ("MBS") solution.²⁷ The *FNPRM*, however, would impose the more stringent accuracy standards for *all* counties or PSAPs within a wireless provider's coverage area.²⁸ By its admission, NextNav would focus on metropolitan areas within its licensed LMS coverage area (*not* all areas within its licensed areas) – an option that would not be available to wireless service providers under the *FNPRM* – and leave other areas to A-GNSS technology.²⁹ Even where NextNav intends to deploy its facilities, the 15-18 month period it suggests is feasible for "most urban markets" seems questionable. In 2012 NextNav sought a 3-4 year extension of its construction requirement for many of its license areas, including a number of medium-sized cities and (notably given the Commission's concern for wireless-only

²⁶ This concern would be relevant for Verizon's CDMA and LTE networks. *See* Reply Comments of Verizon, WT Docket No. 13-301, Attachment at 10 (May 16, 2014) (a "1 dB targeted noise floor rise metric is not suitable for CDMA systems" as "[e]ven a small rise in the CDMA noise floor will have significant capacity effects," and for LTE systems "capacity and performance may be upset by the noise floor rise, especially if the effect is more than a 1 dB noise floor rise.").

²⁷ NextNav Comments at 8 ("A two year initial implementation period will provide adequate time to complete deployment of the necessary indoor positioning infrastructure *to cover significant portions of the population ...*" (emphasis added)).

²⁸ *See FNPRM* ¶ 120.

²⁹ *See* NextNav Comments at 8-11; *see also* T-Mobile Comments at 12 (Commission should be wary of adopting rules based on technology for which no nationwide deployment is planned).

households)³⁰ cities with sizeable university populations.³¹ And NextNav's limited MBS deployments to date indicate that it will require siting approvals or other local government review in many jurisdictions.³²

A local example illustrates the shortcomings of NextNav's business model for service providers, their customers, and the PSAPs that serve them. NextNav's 2012 buildout showing for its Washington-Baltimore service area license reflected coverage in Washington DC, *but not Baltimore*.³³ And a review of the Commission's Universal Licensing System ("ULS") license database indicates that NextNav (through its licensee subsidiary Progeny LMS, LLC") has no licenses that cover Ocean City, Maryland (BEA 14 - Salisbury), notwithstanding Ocean City's 200'-300'-high hotel and condominium buildings and the hundreds of thousands of visitors that populate that area each weekend during the summer months. The Commission's ULS database

³⁰ See *FNPRM* ¶ 28, n.60 (citing to Centers for Disease Control statistics finding that nearly two-thirds of adults aged 25-29 and over half of adults aged 18-24 lived in wireless-only households).

³¹ See Public Notice, *Wireless Telecommunications Bureau Seeks Comment on Requests by Progeny LMS, LLC, FCR, Inc., Helen Wong-Armijo, and PCS Partners, L.P. for Waiver and Extension of Time to Construct 900 MHz Multilateration Location and Monitoring Service Licenses*, 27 FCC Rcd 8070 (WTB 2012); Progeny LMS, LLC, Request for Waiver and Extension of Time, at Attachments D and E (June 21, 2012) (listing Anchorage AK, Knoxville TN, Madison WI, and Mobile AL (3 years) and State College PA, Minneapolis-St. Paul MN, and Urbana-Champaign IL (4 years)).

³² See, e.g., San Francisco Planning Dept., Letter of Determination (July 31, 2013), http://www.sf-planning.org/ftp/files/LOD/2013/07312013_NextNav_LLC_-_Accessory_Use_LOD.pdf (responding to request of Joseph Camicia for determination regarding placement of two antennas); City of Seattle, WA, *Analysis and Decision of the Director of the Department of Planning and Development*, Application No. 3016694, NextNav (Mar. 17, 2014), <http://www.seattle.gov/dpd/LUIB/AttachmentProject3016694ID56883016694.pdf> (granting conditional use permit for antenna facility); Fairfax County, VA, Minutes of Fairfax County Planning Commission Meeting of Mar. 1, 2012, <http://166.94.9.135/planning/minutes/minutes030112.pdf> (approving NextNav collocation requests).

³³ See ULS File Nos. 0005337961 and 0005337963, Call Signs WPQP869 and WPQP870.

indicates there are other similar examples around the country.³⁴ Even assuming that NextNav has since built out (or intends to build out) facilities in some of those areas, it still leaves service providers and PSAPs guessing about whether or where NextNav's technology will be available.

Nothing in NextNav's comments alters the projected timetables for commercial availability of MBS network- and handset-level technologies like NextNav's that Verizon included in its comments.³⁵ NextNav understates the potential impact of its solution for handsets and wireless providers' networks and the need for testing and handset design considerations,³⁶ as Verizon and others explained in their comments.³⁷ Moreover, while NextNav asserts that some handset designs "already include [barometric] sensors,"³⁸ Qualcomm and other commenters describe the limits of those components³⁹ and it is unclear how NextNav's technology, once

³⁴ These include Lincoln, Nebraska, the state capital and home of the University of Nebraska, where the ULS database indicates that NextNav has no licensed spectrum for that BEA license (BEA 119 - Lincoln). In addition, the ULS database indicates that NextNav met its 2012 construction showing for the Wasatch Front area of Northern Utah by establishing coverage in populous Salt Lake County, to the exclusion of Utah, Davis, Weber, and Cache counties, all of which are in Verizon Wireless's coverage area and have sizeable commercial districts (including the cities of Ogden, Orem and Provo), government facilities, or university populations (such as Brigham Young University). *See* ULS File Nos. 0005338046 and 0005338050, Call Signs WPQQ234 and WPQQ235. And while BRETSA touts NextNav's capabilities based on tests conducted in Boulder, Colorado, the ULS database indicates that that area is on the edge of NextNav's reported 2012 coverage in Colorado; Colorado Springs, Greeley, and Fort Collins all appeared to fall outside of its coverage, and its BEA licenses do not cover Pueblo at all. *See* ULS File Nos. 0005391787, 0005391788, Call Signs WPQQ226 and WPQQ227.

³⁵ *See* Verizon Comments at 19-21.

³⁶ *See* NextNav Comments at 25-26.

³⁷ *See* Verizon Comments at 19-21; AT&T Comments at 9-12; Cisco Comments at 3; CTIA Comments at 6-8; TCS Comments at 23-24; T-Mobile Comments at 12-16; *see also* RX Networks Comments at 4 (beacon technology may not be cost-effective).

³⁸ *See* NextNav Comments at 3.

³⁹ *See* Qualcomm Comments at 14-15; AT&T Comments at 15; iPosi Comments at 17-23; *see also* Motorola Mobility Comments at 11 n.17 ("end users have not widely adopted applications for [altimeters/barometric pressure sensors] technology").

deployed, could be backward compatible with those devices, as new software would be needed for the handset to pass the barometric readings back to the location server.

Finally, NextNav unduly discounts the importance of standardization to commercial availability.⁴⁰ Given the need for integration of solutions with commercial wireless networks, handsets, and (for vertical information) PSAPs, this is an instance in which, as the Public Safety and Homeland Security Bureau described it, Commission standards “are dependent upon technologies that have achieved proper study and standardization by the leading standards organizations.”⁴¹ Motorola Mobility in particular describes the myriad ways in which a handset-based component of an E911 location solution could adversely affect handset performance and marketplace viability.⁴² Moreover, A-GPS had undergone a significant degree of standardization before it was presented to 3GPP, and standardization was a less significant issue for U-TDOA because it did not require changes to handsets or the underlying wireless network. NextNav thus draws an apples-to-oranges comparison of its technology to the standardization of A-GPS and U-TDOA.

III. TEST BED-DRIVEN TIMETABLES THAT ACCOUNT FOR TECHNICAL REALITIES WOULD IMPROVE INDOOR LOCATION ACCURACY MORE EFFECTIVELY THAN THE *FNPRM* FRAMEWORK.

Industry and other commenters agree that any timetables for implementing new indoor accuracy standards should be (1) triggered by independent test bed verification that compliant, commercially available solutions are available, and (2) phased in to account for network and

⁴⁰ See NextNav Comments at 12, nn. 35-36.

⁴¹ See *Public Safety and Homeland Security Bureau Releases Letters to 3rd Generation Partnership Program and Open Mobile Alliance*, Public Notice, PS Docket No. 07-114, DA 14-750, at Attachments 1-2 (PSHSB rel. May 30, 2014) (letters from David G. Simpson, Chief, PSHSB, to leadership of 3GPP and Open Mobile Alliance); see also Ericsson Comments at 3.

⁴² See Motorola Mobility Comments at 10-12.

handset deployment challenges and PSAP readiness. Some of the initial comments, however, echo the *FNPRM*'s incorrect presumption that extending and expanding on the current regulatory structure – at even more stringent levels for horizontal accuracy and introducing a vertical component – to indoors as a technology-forcing mandate is necessary to bring about indoor location accuracy improvements.⁴³ CALNENA, for example, characterizes improvements in 911 location accuracy as a zero-sum game between service providers' commercial interests in LTE deployment and the interests of their customers and public safety stakeholders.⁴⁴ In fact, as Verizon and others have explained, the deployment of LTE is a necessary first step toward improvements in location accuracy that will be feasible with the A-GNSS and O-TDOA technologies that have already been standardized and are being deployed in advance of VoLTE. The wide record support for many of the policy framework components that Verizon and others have proposed in their comments would portend less adversarial and more collaborative implementation that similarly builds upon new technologies – if the Commission allows it.

A. The Record Supports Use of a Forward-Looking Test Bed to Measure a Technology Solution's Location Accuracy.

Public safety and industry commenters (including vendors and service providers) all support an independent test bed-based approach to measure whether a particular location solution will meet any new accuracy standards the Commission adopts.⁴⁵ Commenters also generally

⁴³ See *FNPRM* ¶ 47 (“[E]ven if technology currently cannot satisfy the proposed near-term 50-meter accuracy requirement in more challenging environments, the adoption of more stringent requirements ... would afford CMRS providers with sufficient time and incentive to develop the necessary technology to enable compliance with the proposed requirement regardless of the environment.”); NASNA Comments at 6.

⁴⁴ See CALNENA Comments at 2-3.

⁴⁵ See Verizon Comments at 22-24; APCO Comments at 7; AT&T Comments at 5 (conditionally supporting test bed-driven approach as alternate to dispatchable address); BRETSA Comments at 19-20; Cisco Comments at 15-16; iPosi Comments at 28-29; Motorola Mobility Comments at 4-

acknowledge that any new accuracy standards should be measured based on performance using next generation 4G handsets and services.⁴⁶ And Verizon agrees with NASNA that those standards should be uniform nationwide;⁴⁷ NARUC's suggestion that states could adopt their own wireless accuracy standards that exceed the Commission's ignores the Commission's exclusive authority to adopt uniform wireless technical requirements and would create an untenable situation for service providers and their customers.⁴⁸

Where commenters differ is whether test bed certification that a solution meets any new indoor accuracy standards, rather than simple adoption of new regulations, should trigger new implementation timetables for service providers.⁴⁹ For a number of reasons, the former approach (test bed certification) proposed by Verizon and other parties will be more effective by achieving the Commission's public safety objectives in a collaborative manner that better accounts for technology and marketplace realities.

7; NASNA Comments at 8-9; NENA Comments at 27-28; NextNav Comments at 47-50; Qualcomm Comments at 15, 19-20; RX Networks Comments at 10-11; Sprint Comments at 12-15; TCS Comments at 10-11, 33-34; T-Mobile Comments at 8-9; TruePosition Comments at 17-18.

⁴⁶ See Verizon Comments at 24; CTIA Comments at 15; NextNav Comments at 14; RX Networks Comments at 8; TCS Comments at 18-19.

⁴⁷ See NASNA Comments at 10-11.

⁴⁸ See NARUC Comments at 9 n.12; *Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd 18,676, ¶ 104 (1996) ("agree[ing] ... that Federal preemption of intrastate E911 regulation may be necessary to ensure ... the avoidance of state-by-state technical operational requirements that would burden equipment manufacturers and carriers").

⁴⁹ Compare Verizon Comments at 22-24; AT&T Comments at 13, 29-30; Blooston Rural Carriers Comments at 4; Info. Tech. Indus. Council (ITIC) Comments at 3-4; Mobile Future and Competitive Carriers Ass'n (Mobile Future/CCA) Comments at 2-3; Motorola Mobility Comments at 4-9; NTCA Comments at 2-3; Rural Wireless Ass'n (RWA) Comments at 3; Sprint Comments at 12; T-Mobile Comments at 8-9; with APCO comments at 4; BRETSA Comments at 18; IAFC Comments at 2; NASNA Comments at 6; NextNav Comments at 29-30.

First, there are many steps necessary for various solutions to meet the proposed location accuracy standards, as described in Verizon's and other parties' comments.⁵⁰ Parties supportive of the *FNPRM*'s proposed standards and deadlines either ignore or dismiss these realities.⁵¹ Second, and relatedly, there is broad acknowledgement that deployment of new location solutions will require participation by different industry players over which service providers have only limited (if any) influence.⁵² Standards bodies, location solution vendors, chipset manufacturers, handset OS providers, and original equipment manufacturers all will play gating roles in the commercial availability of indoor location solutions, both before and after solutions are available for test bed evaluation.⁵³ As Verizon explained in its comments, triggering reasonable timetables based on test bed certification or approval draws an appropriate balance by applying a clear timeframe for service providers that is based on implementation measures over which providers have meaningful control and oversight.⁵⁴

Third, the repeated experience with wireless E911 implementation – with the original rules in 1996, the handset-based technology rules in 1999 and 2000, digital TTY compatibility in 1997-2000, and PSAP-level measurements in 2007-2008 – is concrete evidence of the perils of

⁵⁰ See *supra* Section II.

⁵¹ See *supra* notes 15-16 and accompanying text.

⁵² See Verizon Comments at 7, 11; AT&T Comments at 6-7; Cisco Comments at 5-15; Intrado Comments at 10-12; Motorola Mobility Comments at 7-9; RX Networks Comments at 10-13; T-Mobile Comments at 2, 5-6.

⁵³ See BRETSA Comments at 25 (circumstances beyond a service provider's control include "inability of location information providers to install their systems in all markets required within the time allotted").

⁵⁴ See Verizon Comments at 22-24.

requiring new E911 and location accuracy standards too far in advance of technology.⁵⁵

Commenters opposed to test bed-based timelines neglect this experience with wireless 911 in advocating for infeasible accuracy standards. Moreover, the Commission has used events other than the simple adoption of rules to trigger implementation timetables when it recognized that compliance is dependent on events outside of a service provider's or licensee's control. And it has done so to achieve important public interest objectives, including in the public safety and disabilities arenas with respect to Wireless Emergency Alerts ("WEAs"),⁵⁶ the Emergency Alert System ("EAS"),⁵⁷ and hearing aid compatibility ("HAC").⁵⁸ Verizon and other commenters would simply apply a similar framework using the test bed certification as the trigger.

Fourth, and more fundamentally, commenters opposing a test bed-based timeline do not demonstrate how the *FNPRM*'s proposal would make indoor location available to consumers more expeditiously. Imposing a timetable on service providers that applies irrespective of when third party vendors make solutions commercially available will not make the solution available to consumers more quickly. Given that the *FNPRM*'s approach will not achieve indoor accuracy improvements for consumers any more expeditiously than a test bed-driven proposal, yet risks

⁵⁵ Verizon Comments at 4-6; CTIA Comments at 10-13; ITIC Comments at 2-3; Mobile Future/CCA Comments at 2-3; Motorola Mobility Comments at 2-3; NTCA Comments at 4-5; RWA Comments at 2-3; *see also* CTIA Comments at 18 (test bed validation approach would mitigate need for waivers in most instances).

⁵⁶ *See* 47 C.F.R. § 10.11 (28-month WEA implementation timetable triggered by availability of FEMA-administered gateway technical specifications).

⁵⁷ *See Review of the Emergency Alert System et al.*, Second Report and Order, 22 FCC Rcd 13,275, ¶ 32 (2007) and Fourth Report and Order, 26 FCC Rcd 13,716, ¶¶ 17-20 (2011) (FEMA publication of Common Alerting Protocol triggered implementation deadline of approximately 21 months total).

⁵⁸ *See* 47 C.F.R. § 20.18(k)(1) (new wireless HAC requirements triggered by publication and Bureau approval of updated ANSI technical standards).

creating a contentious rather than cooperative environment for deployment, on balance the latter approach will better serve the public interest.

Fifth, there is agreement among vendors, service providers and some public safety stakeholders that a test bed approach greatly simplifies any ongoing monitoring and oversight burdens. It would obviate the need for not only a county- or PSAP-level testing regime, but for ongoing indoor testing in general.⁵⁹ In that regard, the CSRIC IV Working Group 1 recommendations for an indoor location accuracy test bed have received broad support from industry and public safety alike and ATIS/ESIF efforts are ongoing.⁶⁰ Those efforts provide a solid framework for a test bed that performs the functions Verizon and other commenters recommend, and underscore that service providers and public safety stakeholders alike are prepared to contribute constructively to its establishment. And relatedly, Verizon and other commenters have proposed reasonable methods for handling PSAP-specific concerns that arise after E911 location solutions are deployed after test bed approval.⁶¹ Directing PSAPs to reach out to wireless providers in the first instance, and limiting any disclosure of test data to PSAPs and the Commission with appropriate confidentiality safeguards,⁶² strikes the appropriate balance.

⁵⁹ See Verizon Comments at 22; AT&T Comments at 5, 29-32; CTIA Comments at 16-17; NASNA Comments at 7-8; NextNav Comments at 55-56; T-Mobile Comments at 20; RWA Comments at 5; *see also* TCS Comments at 3, 9 (market-specific testing may impose burden on wireless providers with little improvement in performance).

⁶⁰ See CSRIC IV Working Group 1, Final Report, *Specification for Indoor Location Accuracy Test Bed*, § 4, at 8 (June 2014) (describing “[t]he consensus approach” achieved in the report).

⁶¹ See Verizon Comments at 33-34; CTIA Comments at 17-18; NextNav Comments at 57-58.

⁶² See Verizon Comments at 35; NASNA Comments at 10, 13; RWA Comments at 5.

B. The Record Supports Phased-In Implementation of Technically Feasible Indoor Location Solutions.

A broad cross-section of public safety and industry stakeholders (including vendors supportive of new accuracy standards) all agree that, given the challenges of deploying any new location technology throughout a service provider's network and coverage area, any new horizontal and vertical indoor standards should be phased in using POPs-based or other technically feasible implementation benchmarks.⁶³ The record shows that reasonable implementation benchmarks, rather than the flash-cut deadlines the Commission has proposed, are the appropriate means of addressing NENA's concern that PSAPs in small and large communities alike enjoy the benefits of indoor location accuracy improvements.⁶⁴ Commenters also broadly acknowledge that capable handsets will be necessary for consumers to benefit from the new capabilities.⁶⁵ The record thus supports incorporating handset capabilities into any implementation timetables the Commission adopts.

There is also broad agreement from public safety and industry commenters that PSAPs will require additional capabilities to be able to handle and process vertical information.⁶⁶

APCO agrees that "enhancements to [PSAPs'] equipment and operations" would be necessary,

⁶³ See Verizon Comments at 24-26; APCO Comments at 4, 6; AT&T Comments at 29-30; BRETSA Comments at 22-23; CTIA Comments at 9-10; iPosi Comments at 9-10, 26; NASNA Comments at 11; NextNav Comments at 8-11; Texas 911 Entities Comments at 9-10; TruePosition Comments at 19-20; *see also* RWA Comments at 6 (focus on urban areas); Qualcomm Comments at 7-8 ("[O-TDOA] deployment plans require extensive infrastructure improvements and substantial capital expenditures by each carrier.").

⁶⁴ See NENA Comments at 26.

⁶⁵ See Verizon Comments at 26; APCO Comments at 6; Motorola Mobility Comments at 7-8; NextNav Comments at 13-14; RX Networks Comments at 13-14.

⁶⁶ See Verizon Comments at 26; APCO Comments at 6; AT&T Comments at 13-14, 17-22; CTIA Comments at 20-21; IAFF Comments at 6-7; Intrado Comments at 12; Motorola Mobility Comments at 15; RWA Comments at 4; Qualcomm Comments at 16-17; TCS Comments at 27-29; Texas 911 Entities Comments at 10; TIA Comments at 9; T-Mobile Comments at 10-11.

and the Texas 911 Entities further explain that many PSAPs “may need more time to prepare their GIS for mapping vertical z-axis display at the PSAP and there may be variations in the time needed among different groups of PSAPs”⁶⁷ NextNav concedes that “detailed floor level identification” (the *raison d’être* of a vertical accuracy standard) would not be available, but posits that “raw altitude data” should be sufficient” for PSAPs in the near term.⁶⁸ PSAPs and their equipment and software vendors, however, would need to develop an algorithm that compares the z-axis determination to the elevation of the existing terrain, and then communicates that information to the 911 call taker in a meaningful way. NextNav’s suggestion that PSAP readiness is a non-issue is thus inconsistent with established Commission rules (that the *FNPRM* did not propose to eliminate) requiring E911 caller location only where PSAPs are capable of “utilizing the data elements associated with” the service.⁶⁹ And even *if* the necessary PSAP-level upgrades are minimal as NextNav asserts, that is a reason for PSAPs themselves to make those necessary minimal investments – *not* for reversing the long-standing and well-thought out PSAP readiness rule.

IV. THE RECORD DOES NOT SUPPORT INCLUDING DELIVERY TIMING IN THE LOCATION ACCURACY MEASUREMENT STANDARD.

Many public safety and industry commenters, like the Commission, acknowledge the trade-off between accuracy and delivery timing (latency).⁷⁰ The trade-off is particularly challenging in environments such as indoors, where location techniques other than a pure GPS-

⁶⁷ APCO Comments at 6; Texas 911 Entities Comments at 10.

⁶⁸ See NextNav Comments at 16, 20.

⁶⁹ See 47 C.F.R. § 20.18(j)(1) (emphasis added).

⁷⁰ See *FNPRM* ¶ 143; APCO Comments at 7; NENA Comments at 10-11; *cf.* NASNA Comments at 2.

based determination may be necessary.⁷¹ There is nothing in the record suggesting that a significantly shorter latency standard than the 30-second standard proposed in the *FNPRM* is technically feasible, certainly not the standard (of less than 10 seconds) recommended by TruePosition and its associated FindMe911 Coalition.⁷² Indeed, while TruePosition asserts that its solution (dependent on both higher-power handset uplink communications and A-GPS capability) would experience approximately a 7-second time-to-first fix, its own test data resulted in 26 seconds, and then only in the urban and suburban settings at its own Wilmington, Delaware test bed.⁷³

Verizon and other commenters, moreover, point out more fundamental methodological and policy problems associated with the *FNPRM*'s proposal to incorporate a 30-second delivery timing component into the accuracy measurement standard. As Verizon and others explain, the proposed standard is internally inconsistent and would reflect a departure from the CSRIC Test Bed on which the *FNPRM* relies as a basis for the proposed standards.⁷⁴

Verizon's recommendation that delivery timing be measured in a test bed independent of the location accuracy standard, consistent with the CSRIC Test Bed, offers a reasonable middle ground that avoids the risk of arbitrary line-drawing implicit in the proposed 30-second rule.⁷⁵ It would acknowledge the importance to PSAPs of the delivery timing component, while not precluding the development and improvement of particular solutions as service providers move

⁷¹ See Verizon Comments at 9, 14-15, and Attachment.

⁷² FindMe911 Coalition Comments at 9; TruePosition Comments at 21-22.

⁷³ See TruePosition Comments at 10-11.

⁷⁴ See Verizon Comments at 29; AT&T Comments at 34-35; Sprint Comments at 19; T-Mobile Comments at 20-21.

⁷⁵ See Verizon Comments at 29-30.

forward with new location technologies. And it would help confirm whether timing standards are necessary at all by giving industry, PSAPs and the Commission an opportunity to assess delivery timing for different technologies in relation to PSAPs' own 911 call handling processes. At minimum, given the challenges that service providers and vendors already will face in improving indoor accuracy, the 30-second delivery timing component should not apply to testing for *indoor* 911 calls.⁷⁶

A few public safety commenters support a much more stringent delivery timing standard to enable wireless 911 calls to be routed to PSAPs based on x/y coordinates (so-called "location-based routing" or "LBR") rather than on cell site or cell sector.⁷⁷ Verizon does not oppose reasonable LBR solutions and is participating in a trial of this technology in Northern California.⁷⁸ LBR routing is not, however, a basis for imposing more stringent delivery timing standards. Verizon has already addressed this issue in its earlier filings in this proceeding, explaining that wireless 911 calls are routed based on cell sector location via pre-determined arrangements with PSAPs in the affected jurisdictions.⁷⁹ These issues are better addressed through cooperative efforts among state and local governments⁸⁰ and wireless service providers to reconfigure PSAP boundaries and 911 call routing in a manner that maximizes the correlation between PSAP jurisdictional boundaries and 911 call locations.

⁷⁶ See *id.* at 9 and Appendix ¶¶ 4-5.

⁷⁷ See BRETSA Comments at 23; CALNENA Comments at 1; Angela Salvucci, Ventura County Public Health Comments at 4.

⁷⁸ See Letter from Nneka Ezenwa Chiazor, Verizon, to Marlene Dortch, FCC, PS Docket No. 07-114, at 3-4 (Nov. 15, 2013).

⁷⁹ *Id.*; Letter from Nneka Ezenwa Chiazor, Verizon, to Marlene Dortch, FCC, PS Docket No. 07-114, at 2 (Nov. 14, 2013).

⁸⁰ See BRETSA Comments at 10-12 (PSAPs' inability to share CAD files is a barrier to addressing routing issues).

CONCLUSION

For the reasons discussed above and in Verizon's comments, the Commission should not expand on the current E911 regulatory framework by imposing more stringent horizontal standards and a new vertical component to indoor location accuracy. The record in this proceeding further confirms that the proposed accuracy standards are technically infeasible – but also offers an alternative indoor location accuracy policy framework that would account for near- and longer-term technology capabilities, and balance the technical challenges of deploying those technologies with the public safety benefits of improved location accuracy, more effectively than the proposed rules in the *FNPRM*. Finally, the record supports Verizon's recommendation that location accuracy and timing delivery standards be assessed separately, consistent with the CSRIC Test Bed methodology.

Respectfully submitted,

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